	Right Ascension.			S. Declination.	
	h.	m.	s.	°	′
h 2036	1	14	4	16	26
,, 3447	1	30	35	30	31
,, 3461	1	40	1	25	39
,, 3494	2	14	46	35	59
,, 5113	19	17	30	29	32
,, 2904	19	47	7	24	14

The "mean results" at the end of this publication apply to upwards of 500 objects.

THE REAPPEARANCE OF ENCKE'S COMET.—Dr. von Asten, in an extract from the *Bulletin* of the St. Petersburg Academy, has circulated an ephemeris of Encke's comet for the return in the present year, and it is also printed in No. 2,197 of the *Astronomische Nachrichten*. The elements have been perturbed to April 24, 1878, taking into account the attraction of the six old planets and the effect of a resisting medium. The perihelion passage takes place July 26·1159, G.M.T., and Dr. von Asten especially insists upon the importance of observations in the southern hemisphere after perihelion, for the improvement of the theory, and urges that at least two complete series of observations with moderately powerful instruments should be obtained, for reasons which he states are explained in a memoir now in the press. The following positions are interpolated from his ephemeris for Berlin noon, corresponding to 8h. 46m. mean time at Melbourne:—

		Right Ascension.			North Polar Distance.		Log. Distance from the earth.
		h.	m.	s.	°	′	
August	1	9	46	0	79	19·8	0·0824
,,	5	10	17	23	83	53·8	0·0597
,,	9	10	47	39	88	28·0	0·0399
,,	13	11	17	24	92	58·0	0·0248
,,	17	11	47	0	97	18·8	0·0155
,,	21	12	16	30	101	24·3	0·0123
,,	25	12	45	47	105	8·7	0·0151
,,	29	13	14	34	108	27·3	0·0233
Sept.	2	13	42	30	111	17·4	0·0359

The elements of the orbit for April 24, 1878, are: longitude of perihelion, 158° 19 41″, ascending-node, 334° 39′ 10″ (M. Eq. 1878·0), inclination, 13° 6′ 40″, eccentricity, 0·8491669, semi-axis major, 2·210691. The perihelion distance is 0·33344, the aphelion distance, 4·08794, and the semi-minor-axis, 1·16752. The sidereal period at the above date is 1200·8 days.

NOTES

THE funeral of the late Prof. Henry, at Washington, was an imposing pageant, being attended by the President and the members of the Cabinet and the Congress—the latter body adjourning from respect to his memory—with a large number of prominent men from all parts of the country. Prof. Spencer F. Baird succeeds Prof. Henry as secretary to the Smithsonian Institution.

A MONUMENT to the late eminent physicist, Dr. Robert von Mayer, will be erected at Heilbronn, in Würtemberg. Herr Gustav Rümelin, the Chancellor of Tübingen University and well-known critic of Shakespeare, will shortly publish a biography of Dr. von Mayer.

PROF. HELMHOLTZ has written to the Royal Institution to obtain a bust of Faraday, and to the French Academy of Sciences for busts of Ampère and Regnault. No bust of Regnault being in existence, one will be executed at the expense of the Government, by M. Noel, and placed in the Hall where the Academy meets. A cast will be sent to Berlin as requested.

THE honorary membership of the Geographical Society of Italy, at Rome, has recently been conferred on Dr. George Bennett, of Sydney, who is well known as a naturalist and traveller, and who it seems had been exceedingly active in the furthering of Signor L. M. d'Albertis' late expedition to New Guinea.

PROF. ERNST HAECKEL has been nominated honorary member of the Geographical Society of Lisbon and of the Microscopical Society of San Francisco.

THE system of science and art education which centres at South Kensington and branches to the remotest parts of the kingdom, has years ago assumed the dimensions of a national organisation and done more, probably, than any other means, to foster a wide-spread artistic taste and a desire for scientific knowledge among the people. The well-trained teachers of the department are everywhere doing their humanising and elevating work. This immense organisation, every one now admits, is mainly due to the energy, intelligence, and foresight of one man, Sir Henry Cole, who has happily survived much that would have daunted a less enthusiastic and public-spirited man—survived to receive, as he did last Thursday, a well-earned and appropriate honour. On that day a large number of ladies and gentlemen assembled at Grosvenor House, by the permission of the Duke of Westminster, for the purpose of presenting to Sir Henry Cole a testimonial, the result of an effort originated some years ago. The memorial was in the form of a marble bust and memorial tablet in della robbia ware, containing a portrait of Sir Henry in mosaic. The total amount of subscriptions was 2,924*l.* 13*s.* 4*d.* After paying expenses for the monument, portrait, and bust, Sir H. Cole had already received 2,000*l.* The Duke of Westminster, in presenting the testimonial, bore testimony to the advantages which Sir Henry Cole had conferred upon the nation in his efforts to promote the development of science and art. Sir Henry Cole, in acknowledgment, said his words could but feebly express his hearty thanks to the princes, peers, commoners, men of science, art, and literature, industrial producers and handworkers, who had joined in this testimonial. After fifty years of public life, with his health declining from the constant strain of official work, he (Sir H. Cole) felt it right to resign his duties. He was not idle in his leisure. His health had improved, and he hoped still to do some useful public work. He was trying to obtain a national recognition for music, the first and most popular of all fine arts, to help elementary education to become the work of the people rather than of the State, and to promote improved health throughout the country. The portrait in mosaic of Sir Henry is to be offered to the South Kensington Museum. The marble bust will be presented to his Royal Highness the Prince of Wales, as president of the Albert Hall, with a request that it should have a suitable place in the Hall.

A STRANGE jubilee is proposed to be celebrated in Italy during 1879. Our readers know that next year 1,800 years will have elapsed since the two cities of Pompeii and Herculaneum were destroyed by earthquakes and eruptions from Mount Vesuvius. It is now intended to celebrate the anniversary of that year of destruction, and the site of the celebration is to be at Pompeii itself, as being the better known of the two buried cities.

IN the April number of the *Bulletin* of the Imperial Academy of St. Petersburg it is stated that a clergyman named Pervouchine has proved that the number $2^{2^{12}} + 1$ is divisible by $7 \cdot 2^{14} + 1$. Bouniakowsky has verified the result at the request of the Academy. Hitherto the only exception known to Fermat's statement, that all numbers of the form $2^{2^m} + 1$ are primes, is that of $m = 5$ where Euler showed that 641 is a divisor.

M. C. TH. LIEBE (*Proc.* Imper. Geol. Instit., Vienna, March 5, 1878) has found a considerable quantity of remains of the Marmot in the Diluvium near Gera (Thuringia), indicating the existence of a larger form than the existing species, and intermediate in character to the European marmot and the bobak, and he regards it as representing the primordial stock from which the living species have proceeded in the course of time. The region in which these remains have been found bears a *steppe* character, the fauna and flora of steppes being met with both in mountainous regions and on plains. M. Liebe, who is a votary of Baron Richthofen's sub-aerial theory, admits the diluvial district of Germany to have been once a steppe region with an extreme climate and analogous to the present steppes of the Altaï.

THE French Ministry for Public Instruction has completed in the Central Palace of the Exhibition the installation of the "Salle des Missions Scientifiques." A large map has been exhibited on which all the names of the scientific missionaries are inserted on the countries which they have explored on behalf of the French Government. The collection of works published by the living members of the "Corps Enseignant" (French University) is ready; it is composed of more than 4,000 volumes neatly bound. This library is open every day from 8 to 10 in the morning. Admission to the palace is obtained at this early hour by a double ticket (price 9 francs). Not a single gallery in the Trocadero Palace has been yet opened. The success of the Exhibition is increasing daily. The average number of admissions on payment has been more than 40,000 a day for the first fourteen days. The sale of tickets by the agents is more than 1,200,000. The number of season-ticket holders was 1,000 in the beginning of last week, although no real advantage is offered to them. The system of conveyance by trams, railways, and steamers is excellent, and working very well. M. Bardoux has proposed a credit of 100,000 francs for the purpose of sending to Paris a number of *instituteurs* who will take part in their special congress during the Exhibition.

THE *Proceedings* of the Literary and Philosophical Society of Liverpool for 1876–77 forms, as usual, a thick volume, containing several papers well worthy of careful reading. The paper of chief scientific interest in this volume is that of Mr. A. J. Mott on Haeckel's "History of Creation," which, with the elaborate discussion that followed, is likely to interest all who are interesed in the subject.

A FIRM at Melbourne, New South Wales, claims to have improved the Abyssinian tube-well by attaching a drill to the first tube, and cutting through rock by imparting a rotary motion to it, instead of merely hammering it through as heretofore, which plan has been found not to succeed in hard soils.

IN confirmation of our remarks on the recent progress sciencewards in Spain, we may state that we have received further papers. One a pamphlet of thirteen pages is a paper entitled *El Alcorán*, by Señor D. Eduardo Saavedra, read at the eighth conferencia (February 25th, 1878) of the *Institucion libre de enseñanza*. The other is the prospectus of the *Revista General de Legislacion y Jurisprudencia*, publicada por D. José Reus y Garcia con la coloboracion de distinguidos Jurisconsultos y publicistas (now in the twentieth year of its publication).

FROM a Japan contemporary we learn that copper-smelting works are being built by Japanese near Kobe. The ore to be used will come from a mine near Ikeda, and is said to contain a considerable quantity of silver which is to be extracted first. Coal and copper appear to have been recently discovered in several places in this part of Japan.

A BRILLIANT meteor was seen at Geneva at 9.45 P.M. on Sunday week. It moved very rapidly from east to west, was in the shape of a pear, and was of a greenish hue, leaving behind it a slight train of light. This was evidently the same meteor that was seen by our correspondents referred to in last week's NATURE; the time was the same, making allowance for the difference of longitude between Geneva and this country.

THE total production of silk cocoons in Europe amounted upon an average to 58,000 tons per year during the last five years. Italy stands first in the list of silk-producing countries; it produces 39,000 tons per year. France produces about 10,000 tons, Turkey 4,000, Spain 2,200, Austria 1,900, Portugal 250, Greece 200, Russia 150, Germany 100, and Belgium and Switzerland only 100 tons together.

THE King of Italy has conferred the Cross of the Order of SS. Maurice and Lazarus upon Prof. Mommsen, of Berlin.

THE well-known geologist and academician, Gregor von Helmersen, of St. Petersburg, celebrated the fiftieth anniversary of his entering the Russian army, on the 5th instant.

IT is telegraphed from New York, May 14, that a despatch from Havannah announces that a terrific earthquake has occurred at Cua, in Venezuela, 600 persons having been killed. A heavy shock was also felt at Caracas. An earthquake is reported from Göttingen. On May 6 two shocks were felt, one at 10.34 the other at 10.37 P.M. The former was of greater force than the latter, and their duration was three and two seconds respectively. An earthquake was also felt in a large number of places in Morbihan (Britanny), on the 14th instant, in the morning; the hours vary according to the places. At Hennebout, a small seaport on the Blavet, it occurred at 7h. 3m., duration six seconds; at Vannes, 5h. 40m. local time (6h. 20m. Paris time). The direction was from west to east. Commotions were also felt in Lorient and Port Louis almost at the same hour as at Vannes.

WE have already referred to the *American Journal of Mathematics* promised us from the Johns Hopkins University, and were able to mention the names of some of the contributors, all of them of the first rank. We have not yet received the first number, but from a note in the *Nation* we see it has appeared, and that the programme will delight our mathematical friends. The first number contains, in 104 handsomely-printed quarto pages, eight articles, two of them from foreign contributors, in which the separate departments of astronomy, mechanics, physics, and pure mathematics are all represented. The first article is a short note of three pages, containing the proof of the proposition, that "if a fourth dimension were added to space, a closed material surface (or shell) could be turned inside out by simple flexure, without either stretching or tearing." This is followed by the first part of a paper upon the lunar theory, by Mr. G. W. Hill. Prof. Eddy, of Cincinnati, presents a simplified equation to express the relationship between the moments of flexure of a straight elastic girder at three successive points of support. An algebraic solution of the so-called irreducible case in cubic equations, with examples, covers eighteen pages. A short note on the theory of groups is communicated by Prof. Cayley, of Cambridge. Prof. Rowland's paper is a contribution to our knowledge of the theory of electric absorption. A very favourable review of Ferrero's treatise on the method of least squares is given by Mr. C. S. Peirce, and the balance of the number is occupied by Prof. Sylvester with a paper in which the new atomic theory of chemistry is applied to the graphical representation of certain mathematical conceptions. A paper on this subject, by Prof. Sylvester, has already appeared in NATURE.

WE notice the appearance of the concluding part of the *Jahresbericht der Chemie* for 1876. This almost indispensable companion of the chemist, founded by Liebig and Kopp, is now under the editorship of Prof. Fittica, of Marburg, assisted by a corps of twelve other leading German and Austrian chemists, and has reached its twenty-ninth volume. A glance at the space allotted to the various sub-divisions gives a general idea of the tendencies of modern chemical research. General and physical chemistry occupy 160 pages, inorganic chemistry 140, organic chemistry 650, analytical chemistry 100, technical chemistry 170, chemical geology 40, and mineralogy 60. Over 1,000 authors are referred to in the course of the work. It is a strange circumstance that German should be the almost exclusive medium for the publication of exhaustive and elaborate annual reports of the progress made in each branch of natural science.

PROF. KOLBE, of Leipzig, has just added another to the numerous German text-books of inorganic chemistry, and justifies its appearance by the opinion that the existing works, with the exception of the translation of Roscoe's Chemistry, contain far too much material for elementary treatises. A vigorous warfare is waged against the now so prevalent use of Latin and Greek names among German chemists, a custom certainly from a foreign standpoint not to be regretted, bringing as it does the scientific nomenclature more in unison with that of England, France, and Italy. We notice also that Prof. v. Richter, of Breslau, has just issued a second edition of his Text-book of Inorganic Chemistry, and that Prof. Wislicenus is engaged on a new and modernised edition of Regnault's Chemistry, the ninth edition of this classical little work which has appeared in Germany.

A SECOND edition of Prof. Klenke's well-known work on the adulteration of food is now being published at Leipzig (Weber). The author has chosen the dictionary form for this edition, and the title is now "Illustrirtes Lexikon der Verfälschungen der Nahrungsmittel und Getränke."

THE last part published of the *Sitzungsberichte der Münchener Academie für* 1877 contains an interesting report by Herr Hermann Schlagintweit-Sakünlünski upon the ethnographical material in the large collections made by the brothers Schlagintweit on their celebrated travels, and gives a detailed account of its distribution at the royal "Burg" at Nürnberg.

THE publication of the eighth edition of Ed. v. Hartmann's "Philosophie des Unbewussten" is now announced. It is a long time since a purely philosophical work has run through eight editions.

THE experiment of using superheated water for locomotives has been successfully tried on the tramway connecting Reveil and Marly-le-Roi, in France. The engines are charged with water heated to 180° C., which is allowed to vaporize as fast as required; and by doing away entirely with furnaces in the locomotives, the dangers of explosion, as well as the causes of terror to passing horses, are easily avoided. A locomotive, propelled in this manner, and attached to two carriages, ascended a gradient of 5½ in the hundred at the rate of sixteen miles an hour.

M. L. A. FORSMANN shows, in a recent communication to the Swedish Academy, that solenoïds are able to produce the same unipolar induction currents as magnets, and that the same laws rule in both cases.

AN immense deposit of guano has recently been discovered in the Wershchowskij grotto near Oizowo, in the Russian government of Kjelze. Chemical analysis proved the quality of the guano to be in no way inferior to that of Peru. It is stated that Prussian agriculturists have already sent agents to Oizowo to purchase large quantities of this guano.

IN the April session of the Deutsche geologische Gesellschaft Prof. Beyrich exhibited two specimens of *Ammonites iphicerus*, one of which came from Lichtenfels, in Bavaria, and the other from Mombassa, in South Africa. On account of their close similarity he assigned to the Jura formations of Mombassa the same age as that of the Bavarian deposits. The specimens attracted especial interest on account of the complete preservation in both cases of the aptychus, the origin and use of which still remain an unsolved problem. Herr Römer presented a specimen of Archæocyathus from the strata in the Sierra Nevada immediately above the archaic deposits. It is the first fossil found in these formations, and places them probably in the old silurian. Papers were likewise presented by Herr Ladebeck on the regularity in the deformation of markasite crystals, and by Herr K. Lossen on the albite gneiss of Schweppenhausen.

SOME experiments have lately been made by M. Grehant with regard to endosmose of gases through lungs separated from an animal. He finds in the phenomenon two distinct phases; in the first, the lungs swell till they even touch the walls of the bell-jar in which they are contained, while a manomoter shows there is considerable increase of pressure. Then comes a second phase, in which the lung returns to its original volume and the pressure diminishes. From observations on the living animal, however, M. Grehant concludes that in this case the phenomenon is very slight indeed.

PROF. KIRCHHOFF has presented to the Berlin Academy a series of considerations on the movement of the electric current in submarine cables, based on Helmholtz's well-known equations for the components of the intensity of a current, and the electrostatic moment dependent on the capacity for dielectric polarisation. The conclusions deduced are, that the rapidity of propagation of the electric waves increases with the conductivity of the gutta-percha covering, while the breadth of the undulations decreases in the same ratio.

A GERMAN translation of Father Secchi's work, "On the Astronomy of the Fixed Stars," will shortly be published by F. A. Brockhaus, of Leipzig. It will form the thirty-fourth volume of the International Scientific Library.

IN No. 8 of the *Journal* of the Russian Chemical Society are two papers, by M. Lermontoff, on the employment of two galvanometers provided each with a Töpler's apparatus for reducing the oscillations of a magnet, and on the methods employed by M. Brauer for the construction and verification of balances of precision. This latter paper is a detailed description of the methods devised by the skilful optician of the Pulkova Observatory for manufacturing and adjusting the prisms of balances, special apparatus having been devised by him and constructed for these purposes. The verifying apparatus discovers any deviation from the straight line on which the prisms should be placed, if it exceeds 30″, and the equality of the length of the arms of the balance is verified with a precision of 0·0000125 of their length. We are all the more pleased to see the appearance of such a description, as the methods used by constructors of precise scientific apparatus are generally unknown. We notice also in the same number a note, by M. Borgmann, on Maxwell's theory on the tensions in the magnetic field; and a note, by M. Geschus, on the various theories proposed for explaining the radiometer.

A. ARZRUNI communicates, in arecentt number of Groth's *Zeitschrift für Crystallographie*, a number of interesting results from a study of the crystalline properties of various organic bodies. Triphenyl-benzene is found to possess the property of double refraction in a degree surpassing that of any other crystalline body yet known. In substituted compounds he shows also that the introduction of the nitro-group invariably causes a much slighter change in crystallographic properties than when hydrogen is substituted by bromine or iodine.

THE Phylloxera, which has been in Spain and Portugal for some time, is now reported to have got as far as Greece.

THE additions to the Zoological Society's Gardens during the past week include a Syrian Fennec Fox (*Canis famelicus*) from

Arabia, presented by Commander F. Catton; a Wood Owl (*Syrnium aluco*), European, presented by Mr. C. B. Wharton; a Copper Head Snake (*Cenchris contortrix*) from North America, presented by Dr. Painter; a European Bearded Vulture (*Gypaëtus barbatus*), South European, a Rattlesnake (*Crotalus durissus*) from North America, deposited; a Collared Fruit Bat (*Cynonycteris collaris*), a Reindeer (*Rangifer tarandus*), a Chinchilla (*Chinchilla lanigera*), born in the Gardens.

RECENT RESEARCHES ON THE PHENOMENA OF FLUORESCENCE

SOME time ago Herr E. Lommel drew attention to the fact that certain substances do not follow the rule mentioned by Prof. Stokes, viz., that each ray of light produces fluorescent rays of smaller refrangibility only; recently Herr Lommel found several other substances which partly follow and partly deviate from Stokes's rule, which is thus proved to be of somewhat limited validity. Herr Lommel communicated his further researches on this subject at a recent meeting of the Physical Society of Erlangen. He now divides all fluorescent bodies into three classes: the *first class* comprises those substances upon which each homogeneous ray of light, capable of producing fluorescence, produces the whole fluorescent spectrum (fluorescence of the first order); the *second class* contains those substances upon which the same ray of light produces only those rays of the fluorescent spectrum which are of a smaller (or at most of an equal) refrangibility than the ray itself (fluorescence of the second order). The *third class* finally, embraces those bodies whose fluorescent spectrum consists of two parts, one of which corresponds to fluorescence of the first, and the other to fluorescence of the second order (compound fluorescence). Herr Lommel enumerates nine substances of class I., twenty-five of class II., and seven of class III., and gives the commencement of their fluorescence in the spectrum and the extent of the latter in tables accompanying his paper.

If we examine the series of substances enumerated by Herr Lommel, we find no less than fifteen different ones, which deviate from Stokes's rule, *i.e.*, depart from it altogether (the nine substances of class I.) or only in part (the first six substances of class III.). Of course the substances in class II. which follow this rule are more numerous. Investigating the peculiarities of these three classes more closely, and in various directions, we arrive at the following conclusions:—

1. The first class comprises substances with very strong bands of absorption only, of which one remains visible even when the solution is greatly diluted and after the absorption in other parts of the spectrum has become imperceptible. Accordingly these substances are strongly and intensely coloured (green, red, orange, yellow). The absolute maximum of fluorescence corresponds to this absolute maximum of absorption in the fluorescence-spectrum.

2. The second class embraces all fluorescent substances which show only a one-sided absorption of the more refrangible end of the spectrum. They therefore appear yellow, brown, or colourless, the latter principally if the absorption bands lie only in the extreme violet and ultraviolet.

To this class certain bodies belong which show absorption bands to which maxima of fluorescence correspond at the same time. But these absorption bands appear broad and indistinct (so-called shadows) and they are not really maxima. If the solution is diluted they disappear very soon, and long before the absorption in the violet ceases to be perceptible. Nitrate of uranium shows a number of strongly marked absorption bands, which, however, are in nowise related to fluorescence. Uranium glass as well, which belongs to the first class, shows absorption bands in the red and yellow which have nothing to do with its fluorescence. The green colour of the fluor spar from Alston Moor is caused by an absorption band in the red, and this also has no reference to fluorescence.

3. The third class, like the first, contains only bodies with strong absorption bands and of intense coloration (green, blue, violet, red, orange).

Fluorescence of the first order therefore seems to be in causal connection with the existence of a prominent maximum of absorption and fluorescence.

4. The fluorescent spectrum of the substances in class I. is of equal colour everywhere, if we neglect the slight changes in the shades of colour, which are caused by the absorption exercised by the substance upon its own fluorescent light. At the parts which are less fluorescent, a proportionate diminution of the fluorescent rays most subject to absorption takes place, and hence a deepening of the shade; these rays are at the same time the more refrangible ones in all bodies belonging to this class.

5. The fluorescent spectrum of the substances in class II. is of unequal colour, changing gradually its tone of colour, and it only becomes equal where the spectrum of the fluorescent light ends. But even here the fluorescent spectrum may seem of equal colour everywhere to the naked eye. This is the case where the spectra of the exciting and the excited rays are superposed on one another only a little (morine-alumina solution; nitrate of uranium), or if the fluorescence begins in the blue or in the violet.

6. The fluorescent spectrum of the bodies in class III. consists of two parts, viz., one equally coloured in its whole length (less refrangible), and one coloured differently, with gradual change of colour (more refrangible), becoming equally coloured only where the total spectrum of the fluorescent lights ends. At the boundary of the two parts an almost sudden change of colour takes place.

7. The substances of class III. behave like mixtures of a substance of class I. and one of class II.

The solutions of orchil and litmus appear as mixtures of two fluorescent substances, from the fact that, according to the dissolving medium, now one and now the other fluorescence is prominent, and the aspect of the total fluorescence changed. From two different kinds of litmus Herr Lommel obtained alcoholic extracts, of which the one showed orange and the other greenish-yellow fluorescence in daylight; their fluorescent spectra, however, showed no difference, except that the yellowish-green part was proportionately more developed in the second specimen. Fluoride of aniline may also be considered as a mixture of two fluorescent substances. That brasileïne is a mixture of this kind is rendered very probable by the circumstance that the fluorescence of the second order is destroyed by the addition of soda, but strengthened by the addition of ammonia, while that of the first order remains intact. Whether the chamaeleïne colouring matters are really chemical compounds, as they certainly appear to be, must first be decided by a closer investigation of these substances.

If it could be proved beyond doubt that all these substances are mixtures of two fluorescent substances, we might abolish class III. altogether, and enumerate the separated substances in classes I. and II. But, since this separation has not yet been actually effected, and since the possibility, that a unit (*einheitlich*) molecule may possess both kinds of fluorescence simultaneously, cannot be discarded *à priori*, Herr Lommel felt compelled still to retain class III., *i.e.*, bodies possessing compound fluorescence.

By artificially mixing substances of the first and second class, fluorescences of the third order may be obtained in great variety. In this way wonderful effects of colour are often obtained, and they may be rendered still more astonishing by the addition of strongly coloured non-fluorescent substances.

Thus we see that yet other compound fluorescences than those belonging to class III. are possible, and may, indeed, be produced artificially; viz., confining ourselves to only two fluorescent substances, by mixing two substances of the first or two substances of the second class. A mixture of the first kind (of naphthaline-red with fluoresceïne, or with eosine, for instance) may be easily recognised as such when examined by its spectrum; their fluorescent spectrum consists of two parts separated by a minimum, neither of which follows Stokes's rule, but of which the second refrangible part (belonging to the fluoresceïne or eosine) disappears, as soon as the incident homogeneous light has been diminished down to that limit, where it ceases to cause fluorescence in these substances. It is, however, more difficult to recognise a mixture of two substances of the second class as such, as it behaves like a simple substance of that class. It is possible that amongst the substances enumerated in class II. there are mixtures of this nature, consisting of two or more substances not separated hitherto. The varying behaviour of the extracts of soot could, for instance, be easily explained by the supposition that in soot there are contained two or more fluorescent substances of the second class, which are dissolved in varying proportions by the dissolving media.

Herr Lommel did not feel justified in establishing separate classes for the two kinds of compound fluorescence just de-